DETAILED ACTION

Response to Amendment

1. Applicant's amendments and accompanying remarks have been entered and fully considered. Claims 1, 21-24, 28, 32-41 have been amended. Claims 1, 12, 15, 18, 21-41, 51-53 are now pending.

Drawings

2. The drawings are objected to because unlabeled rectangular box(es) and oval shown in the drawings (figures 1, 2) should be provided with descriptive text labels. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the

applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the feature (claim 1 lines 2-10 and similar features in claim 21 lines 3-10, claim 23 lines 3-11, claim 24 lines 2-11, claim 28 lines 3-10, claim 32 lines 4-12, claim 35 lines 4-12, claim 40 lines 2-10, claim 41 lines 4-12) "*each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies, wherein a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the plurality of users*" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New

Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claim(s) 1, 12, 15, 18 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. The instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1, 12, 15, 18, 21-41, 51-53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. The limitation (claim 1 lines 2-10 and similar recitations in claim 21 lines 3-10, claim 23 lines 3-11, claim 24 lines 2-11, claim 28 lines 3-10, claim 32 lines 4-12, claim 35 lines 4-12, claim 40 lines 2-10, claim 41 lines 4-12) "*allocating a plurality of sets of sequential subcarriers in a multicarrier modulation communication system to a plurality of users, each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies, wherein a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the plurality of users, wherein each user of the plurality of users has a respective channel profile including a respective coherence bandwidth and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*" is indefinite.

9. If only a small amount of data is expected to be transmitted on a given transport channel to a plurality of users and the resulting *size of each one of the plurality of sets of sequential subcarriers* happens to be less than *the smallest coherence bandwidth of the plurality of users* – then, according to the limitation, no transmission would take place.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 12, 15, 18, 21-41, 51-53 (as best understood) are rejected under 35 U.S.C. 102(e) as being anticipated by Walton (PGPUB: 20040081131).

Regarding **Claim 1**. Walton teaches (Page 1, Para 5) *a method of allocating* (Para 10: allocating different sets of subbands to different users; partitioning, Fig. 5 shows access points and multiple devices, Fig. 8 shows an access point communicating with two user terminals, controllers controlling OFDM symbol size) *a plurality of sets of sequential subcarriers* (Para 5: partitioning of overall system bandwidth into subbands) *in a multicarrier* (OFDM) *modulation communication system to a plurality of users* (Page 1, Para 10),

each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),

a size (Bandwidth) *of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the users*

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving

signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

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[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 12**. Walton teaches (Page 3, Para 38) *the size of a set of sequential subcarriers comprises a power of two* (sizes are powers of two).

Regarding **Claim 15**. Walton teaches (Page 1, Para 10) *within an allocation period each set* (reserved subband set) *of sequential subcarriers* (subbands) *is of the same size* (OFDM partitions the system bandwidth into a number of subbands Page 1, Para 5. The number of subbands is determined by the size of the IFFT Page 1, Para 6. The system bandwidth is divided into N subbands with the use of an N-point IFFT Page 2, Para 31).

Regarding **Claim 18**. Walton teaches (Page 3, Para 32) *allocating* (size of the OFDM symbol) *the plurality of sets of sequential subcarriers* (subbands) *by taking into account channel properties* (coherence time) *of at least one user* (multiple users share the OFDM symbol Para 10).

Regarding **Claim 21**. Walton teaches (Page 1, Para 5) *a controller configured to allocate* (Para 10: allocating different sets of subbands to different users) *a plurality of sets of sequential subcarriers* (subbands) *in a multicarrier modulation* (OFDM) *communication system to a plurality of users* (Para 10: different users),
each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),

a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel being used by at least one of the plurality of users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

Para [0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size; [0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving

signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

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[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 22**. Walton teaches (Page 4, Para 48) *a network element, apparatus, for a cellular* (mobile, wireless) *telecommunications network*.

Regarding **Claim 23**. Walton teaches (Page 1, Para 10) *a multicarrier modulation communication system, a controller* (OFDM system Para 135) *configured to allocate* (allocating different disjoint sets of subbands to different users) *a plurality of sets of sequential subcarriers* (sets of subbands) *to a plurality of users* (allocating to different users) *in an allocation period* (OFDM symbol period Para 07),
each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),
a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel being used by at least one of the plurality of users
(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies;

[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

Para [0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

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interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies;
[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;
[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;
[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 24**. Walton teaches (Page 1, Para 10) *transmitting at least one signal* (transmitting at least a packet Para 11) *relating to at least one set of sequential subcarriers* (subbands) *in a multicarrier modulation communication system* (OFDM system Para 135) *among a plurality of sets of sequential subcarriers* (sets of subbands) *allocated* (allocating different sets of subbands to different users) *in an allocation period* (OFDM symbol period Para 07) *to a plurality of users* (allocating to different users), *each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies* (Para 10: allocating different sets of subbands to different users; partitioning),
a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

Para [0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size; [0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol), *each user of the plurality of users has a respective channel profile including a respective coherence bandwidth* (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of*

sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 25**. Walton teaches *allocating the plurality of sets of sequential subcarriers* (Page 1, Para 10: allocating sets of subbands to different users) *for transmitting information to the plurality of users.*

Regarding **Claim 26**. Walton teaches *transmitting a plurality of signals* (Page 8, Para 84: transmitted downlink signals) *to the plurality of users* (Page 8, Para 84: each user terminal).

Regarding **Claim 27**. Walton teaches (Page 1, Para 10) *allocating the plurality of sets of sequential subcarriers* (allocating different disjoint sets of subbands to different users Page 1, Para 10) *for transmitting information from* (techniques for uplink using OFDM symbols Para 134) *the plurality of users* (allocating to different users).

Regarding **Claim 28**. Walton teaches (Page 1, Para 10) *receiving at least one signal* (reference received on a subband Para 122 Page 10) *relating to at least one set of sequential subcarriers* (subbands) *among a plurality of sets of sequential subcarriers* (sets of subbands) *allocated to a plurality of users* (allocating different sets of subbands to different users) *in an allocation period* (OFDM symbol period Para 07),
each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),
a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least of the users
(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in

the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies;

[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;
[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;
[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 29**. Walton teaches (Page 1, Para 10) *allocating the plurality of sets of sequential subcarriers* (allocating different sets of subbands to different users) *for receiving* (uplinked signals are received by antennas Para 88 Page 8) *information from the plurality of users* (allocating to different users).

Regarding **Claim 30**. Walton teaches (Page 8, Para 88) *receiving a plurality of signals* (uplinked signals are received Para 88 Page 8) *from the plurality of users* (uplink from a user terminal Para 70, uplinks from user terminals Para 51).

Regarding **Claim 31**. Walton teaches (Page 1, Para 10) *allocating the plurality of sets of sequential subcarriers* (allocating different sets of subbands to different users) *for receiving information* (communication link to the user terminal Para 48, Page 4) *in the plurality of users* (allocating to different users).

Regarding **Claim 32**. Walton teaches (Page 1, Para 10) *a transmitter* (mobile station, wireless device Para 48) *configured to transmit at least one signal* (transmitting at least a packet Para 11) *relating to at least one set of sequential subcarriers among a plurality of sets of sequential subcarriers* (subbands) *allocated to the plurality of users* (allocating different sets of subbands to different users) *in an allocation period* (OFDM symbol period Para 07),

each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),

a size of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel being used by at least one of the plurality of users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of*

sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;
[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;
[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 33**. Walton teaches (Page 1, Para 10) *plurality of sets of sequential subcarriers is allocated for transmitting information* (techniques for uplink using OFDM symbols Para 134) *to the plurality of users* (allocating different sets of subbands to different users).

Regarding **Claim 34**. Walton teaches (Page 1, Para 10) *plurality of sets of sequential subcarriers is allocated for transmitting information from the plurality of users* (allocating different sets of subbands to different users), *the apparatus corresponding to at least one of the users* (A user terminal also referred to as an access terminal, a mobile station, a user equipment (UE), a wireless device Para 48).

Regarding **Claim 35**. Walton teaches (Page 1, Para 10) *a receiver configured* (OFDM symbol size for each time segment configured Para 40 Page 3) *to receive* (receiver Para 130, Page 11) *at least one signal relating to at least one set of sequential subcarriers* (subbands) *among a plurality of sets of sequential subcarriers allocated to a plurality of users* (allocating different sets of subbands to different users) *in an allocation period* (OFDM symbol period Para 07),

each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),

the size of a set of sequential subcarriers is greater than the smallest coherence bandwidth of the users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter.

The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

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the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;
[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;
[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 36**. Walton teaches (Page 1, Para 10) *plurality of sets of sequential subcarriers* (subbands) *is allocated for receiving information* (communication link to the user terminal Para 48, Page 4) *from the plurality of users* (allocating different sets of subbands to different users).

Regarding **Claim 37**. Walton teaches (Page 1, Para 10) *plurality of sets of sequential subcarriers* (subbands) *is allocated for receiving information in the plurality of users* (allocating different sets of subbands to different users), *the apparatus corresponding to*

at least one of the users (A user terminal also referred to as an access terminal, a mobile station, a user equipment (UE), a wireless device Para 48 Page 4).

Regarding **Claim 38**. Walton teaches (Page 1, Para 10) *the apparatus further configured* (OFDM symbol size for each time segment may be configured Para 40 Page 3) *to allocate the plurality of sets of sequential subcarriers* (allocating different sets of subbands).

Regarding **Claim 39**. Walton teaches (Para 48 Page 4) *the apparatus* (a mobile station, a wireless device) *is for a cellular telecommunications network* (MIMO-OFDM system).

Regarding **Claim 40**. Walton teaches *a transmitter* (Fig 9A [0094]), *allocating* (partitioning) *a plurality of sets of sequential subcarriers* (partitioning of overall system bandwidth into subbands) in a multicarrier (respective carrier) modulation communication system to a plurality of users (Page 1, Para 10),
each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),
a size (Bandwidth) *of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the plurality of the users*

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of*

sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 41**. Walton teaches *a receiver and controller* ([0084] user terminal), *to receive sets of sequential subcarriers* (partitioning of overall system bandwidth into subbands) in a multicarrier (respective carrier) modulation communication system to a plurality of users (Page 1, Para 10),

each of said plurality of sets of sequential subcarriers comprising at least two subcarriers having different frequencies (Para 10: allocating different sets of subbands to different users; partitioning),

a size (Bandwidth) *of at least one set of the plurality of sequential subcarriers is greater than a smallest coherence bandwidth used in a channel currently being used by at least one of the plurality of users*

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies; [0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol),

each user of the plurality of users has a respective channel profile including a respective coherence bandwidth (Coherence bandwidth is proportional to the inverse of the delay spread [0030] frequency selective fading is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system) *and the size of at least one set of the plurality of sets of sequential subcarriers is greater than a smallest one of the coherence bandwidths of the plurality of users*

(Coherence bandwidth is proportional to the inverse of the delay spread [0030] cyclic prefix is used to combat frequency selective fading, which is caused by delay spread in the system. The delay spread for a transmitter is the difference between the earliest and latest arriving signal instances at a receiver for a signal transmitted by that transmitter. The delay spread of the system is the expected worst-case delay spread for all transmitters and receivers in the system. To effectively combat inter-symbol interference, the length of the cyclic prefix is selected based on the delay spread of the system such that the cyclic prefix contains a significant portion of all multipath energies;

[0031] FIG. 2 OFDM symbols of different sizes including the fixed overhead due to the cyclic prefix;

[0032] using an OFDM symbol with the largest size possible: This means that the users can have a sequential subcarrier size, set of subbands, up to a maximum size;

[0054] If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol).

Regarding **Claim 51**. Walton teaches *channel properties include the channel response for each set* (channel response matrices page 11 [0131]).

Regarding **Claim 52**. Walton teaches *channel response for a set is measured for one of the plurality of subcarriers of the set* (channel response for each subband page 10 [0104]).

Regarding **Claim 53**. Walton teaches *channel response for a set is measured at the lowest subcarrier of the set* (since the channel response is measured for each subband, this would include the lowest subband page 10 [0104]).

Response to Arguments

11. Applicant's arguments have been fully considered but they are not persuasive.

12. For example, if

user 1 has a set of size 1 and coherence bandwidth 1,

user 2 has a set of size 2 and coherence bandwidth 2,

user 3 has a set of size 3 and coherence bandwidth 3; and,

set of size 1 > set of size 2 > set of size 3,

and coherence bandwidth 1 > coherence bandwidth 2 > coherence bandwidth 3.

Then if

bandwidth associated with set of size 1 > coherence bandwidth 3,

the limitation will be satisfied. As seen above

coherence bandwidth 1 > coherence bandwidth 3; and,

the bandwidth associated with set of size 1 could be less than, equal to, or more than coherence bandwidth 1 - and the limitation would still be met.

13. The concept of utilizing a bandwidth which is higher that the coherence bandwidth is well known in the art and has been utilized in CDMA systems with commercial success.

14. The bandwidth of CDMA waveform has been designed to be much higher that the coherence bandwidth. Therefore, when fading occurs, it occurs only over a relatively small fraction of the total CDMA signal bandwidth. The portion of the signal bandwidth over which fading does not occur contains sufficient signal power to sustain reliable communications.

15. CDMA signals are resistant to multipath fading. The CDMA spread spectrum signal occupies a large bandwidth wherein only a small portion of this bandwidth will undergo fading due to multipath at any given time. Spread spectrum techniques use a transmission bandwidth that is several orders of magnitude greater than the minimum required signal bandwidth.

16. The main argument on page 18 first paragraph through third paragraph is regarding the case law, *In re Bilski*, which, as stated in the argument, is under review by

the U.S. Supreme Court. However, until further guidance from the courts, since the method claim 1 is not tied "to a particular machine or apparatus" - the rejection is maintained.

17. The main argument on page 21 third paragraph is that hypothetical situations had been addressed in the previous office action. Examiner respectfully points out that the claims do not exclude the embodiment to which the USC 112 second paragraph rejection has been maintained.

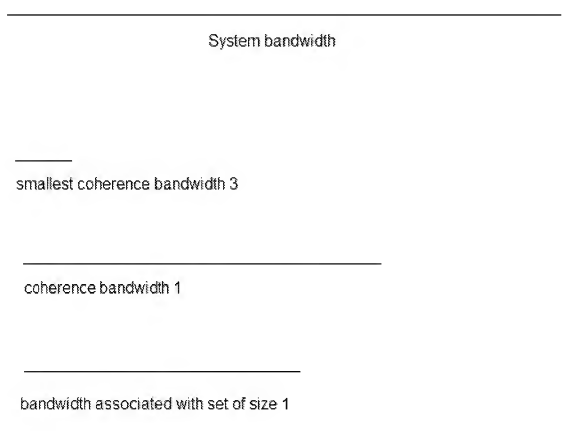
18. The main argument on page 22 second paragraph through page 27 is regarding the prior art rejection of the claims. The arguments are unclear since page 24 second paragraph lines 2-5 (and page 24 last paragraph - page 25 first line) is referring to a limitation that is no longer in the amended claims.

19. The argument on page 25 is unclear since it restates the same engineering principle that was stated in the previous office action on page 23, lines 5-6 from the bottom of the page, by the examiner.

20. The argument on page 25 last two lines through page 26 is regarding the various embodiments that have been disclosed by the reference. Examiner respectfully points out that the various embodiments pointed to by the applicant on pages 19-20 of the instant communication regarding the disclosed invention, and by the examiner, on pages 23-24 of the previous office action, show that the size of a set of sequential subcarriers maybe smaller than, or equal to the smallest coherence bandwidth of the plurality of users in the disclosed invention. It appears that the applicant is arguing that

these embodiments are also disclosed by the reference. However, these embodiments have not been claimed, and hence the purpose of the argument is unclear.

21. A drawing would help visualize the engineering system of the claimed invention and would assist in clarifying the arguments. A drawing is presented below:



Examiner respectfully points out that to meet the claimed limitations, just one user in the system would need to have a bandwidth which is larger than the smallest coherence bandwidth of all of the users in the system. As illustrated above user 3 has the smallest coherence bandwidth of all of the users in the system. User 1 has a larger coherence bandwidth than user 3. The bandwidth associated with set of size 1 for user 1 maybe

larger than coherence bandwidth 1, it maybe equal to coherence bandwidth 1, or it may be smaller than coherence bandwidth 1 (as shown above) - and still be larger than coherence bandwidth 3. In addition, users 2 and 3 may have a bandwidth which is smaller than the smallest coherence bandwidth of all of the users in the system - and the claimed limitations would still be met. Coherence bandwidth is a user dependent quantity.

22. Furthermore, in the background section, the reference teaches ([0009] For example, if N_{cp} is 16 samples and N_S is 64 samples, then 20% of the bandwidth is lost to cyclic prefix overhead. This percentage may be decreased by using a relatively large value of N_S. Unfortunately, using a large value of N_S can also lead to inefficiency, especially where the size of the information unit or packet to be transmitted is much smaller than the capacity of the OFDM symbol. For example, if each OFDM symbol can carry 480 information bits, but the most common packet contains 96 bits, then packing efficiency will be poor and much of the capacity of the OFDM symbol will be wasted when this common packet is sent). Hence if e.g. 480 information bits are to be transmitted, then the full capacity of the OFDM symbol will be utilized. If however the size of the information unit or packet to be transmitted is much smaller than the capacity of the OFDM symbol, then bandwidth will be wasted.

23. In addition the reference teaches ([0033] the use of the largest possible OFDM symbol may be inefficient from other standpoints. In particular, if the data-carrying capacity of the OFDM symbol is much greater than the size of the payload to be sent, then the remaining excess capacity of the OFDM symbol will go unused. This excess

capacity of the OFDM symbol represents inefficiency. If the OFDM symbol is too large, then the inefficiency due to excess-capacity may be greater than the inefficiency due to the cyclic prefix). Therefore, if the size of the payload to be sent is the same size of the data-carrying capacity of the OFDM symbol - then the use of the largest possible OFDM symbol will be efficient. However, if the size of the payload to be sent is less than the largest possible OFDM symbol - then the remaining excess capacity of the OFDM symbol will go unused and is wasted.

24. The reference further teaches ([0054] since different transport channels may be associated with different types of data, a suitable OFDM symbol size may be selected for use for each transport channel. If a large amount of data is expected to be transmitted on a given transport channel, then a large OFDM symbol may be used for that transport channel. The cyclic prefix would then represent a smaller percentage of the large OFDM symbol, and greater efficiency may be achieved), ([0055] to attain higher efficiency, the OFDM symbol size for each transport channel may be selected to match the expected payload size for the type of data to be transmitted on that transport channel. Different OFDM symbol sizes may be used for different transport channels. Moreover, multiple OFDM symbol sizes may be used for a given transport channel).

25. Examiner respectfully points out that if the amount of data, that is expected to be transmitted on a given transport channel to at least one user, is higher than *the smallest coherence bandwidth of the plurality of users* - then the claimed limitation is automatically fulfilled.

However, If only a small amount of data is expected to be transmitted on a given transport channel to a plurality of users, and the resulting *size of a set of sequential subcarriers* for plurality of users is less than *the smallest coherence bandwidth of the plurality of users* – then, according to the limitation, no transmission would take place.

26. Furthermore (page 18 of the specification) states:

> **[0068]** As can be seen in Figure 6, the difference in spectral efficiency is at most 0.1 bps/Hz for methods 2 and 3 with respect to the reference method 4. Even when the size of the set of sequential subcarriers is determined to be about twice the smallest channel coherence bandwidth (that is, $F = 2$), the difference in the spectral efficiency is only about 0.2 bps/Hz. Figure 6 shows no simulation results for this case. It is furthermore noted that the losses would be even smaller if the gain due to simplified signaling would be taken into account.

Hence even if an embodiment is utilized where (lines 3-4) *size of the set of sequential subcarriers is determined to be about twice the smallest channel coherence bandwidth (F=2)* – the difference in the spectral efficiency would be minimal (line 5: only about 0.2 bps/Hz).

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hooman Houshmand whose telephone number is (571) 270-1817. The examiner can normally be reached on Monday - Friday 8am - 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on (571) 272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. H./
Examiner, Art Unit 2465

/Jayanti K. Patel/
Supervisory Patent Examiner, Art Unit 2465